

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
13 March 2003 (13.03.2003)

PCT

(10) International Publication Number  
**WO 03/021340 A3**

(51) International Patent Classification?: **G09G 3/32,**  
**H01L 51/20**

(21) International Application Number: **PCT/GB02/03935**

(22) International Filing Date: **29 August 2002 (29.08.2002)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:  
**0121077.2 30 August 2001 (30.08.2001) GB**

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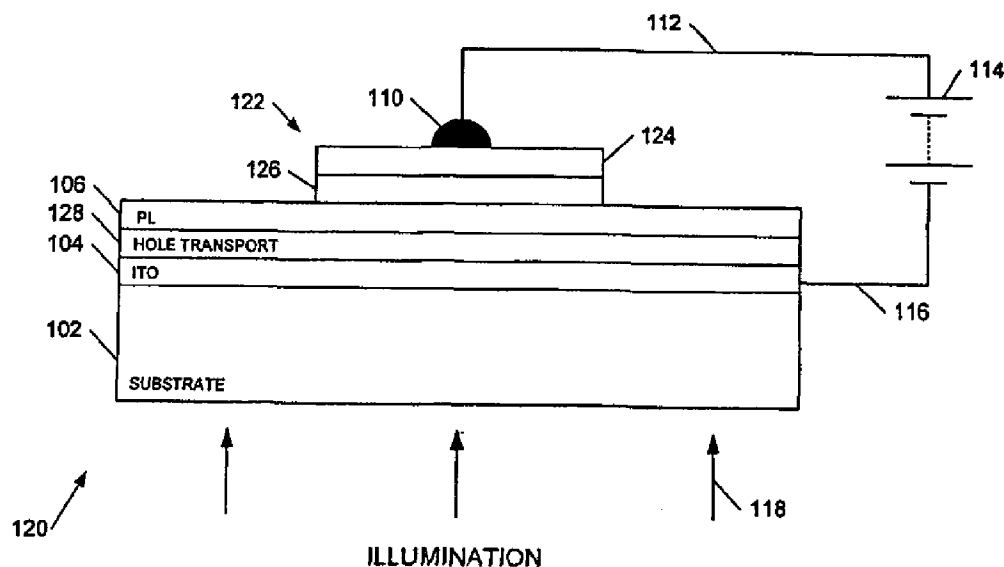
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(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, OM, PI, PL, PT, RO, RU, SD, SE, SG,  
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,  
VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: **OPTOELECTRONIC DISPLAYS**



(57) Abstract: Apparatus and methods for providing displays based upon the principle of photoluminescence quenching are described. The invention includes a method of displaying information using photoluminescence quenching, the method comprising: providing an optoelectronic display comprising a photoluminescent material between a pair of electrodes; providing illumination for the photoluminescent material to cause the photoluminescent material to photoluminesce; and biasing the electrodes to at least partially quench said photoluminescence.

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Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,  
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:  
8 May 2003

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/03935

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G09G3/32 H01L51/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G09G H05B H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                     | Relevant to claim No. ,   |
|------------|--|---|
| X          | US 3 649 867 A (CHESTER ARTHUR N ET AL)<br>14 March 1972 (1972-03-14)<br><br>the whole document<br><br>---<br><br>-/-- | 1,7,8,<br>12,13,<br>19-21,<br>26,29,<br>62,65,<br>68,69,<br>73,74,<br>76,77 |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

Date of the actual completion of the international search

20 December 2002

Date of mailing of the international search report

28.03.03

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/03935

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.  |
|------------|---|--|
| X          | DEUSSEN M ET AL: "Electric field-induced photoluminescence quenching in molecularly doped polymer light-emitting diodes"<br>CHEMICAL PHYSICS, 15 JUNE 1996, ELSEVIER, NETHERLANDS,<br>vol. 207, no. 1, pages 147-157,<br>XP002226051<br>ISSN: 0301-0104<br>the whole document   | 1-7,16,<br>22,<br>26-29,<br>32,34,<br>35,<br>39-43,<br>68-70 |
| X          | ---<br>PARKINSON M ET AL: "An analysis of photoluminescence voltage quenching and band structure of nanoporous silicon"<br>THIN SOLID FILMS, 4 AUG. 1998, ELSEVIER, SWITZERLAND,<br>vol. 326, no. 1-2, pages 194-200,<br>XP002226052<br>ISSN: 0040-6090<br>the whole document   | 1,7,8,<br>13,22,<br>26,29,<br>68,69,73                       |
| X          | ---<br>TOSHIYA YOKOGAWA ET AL: "EFFECTS OF ELECTRIC FIELD ON ZNSE/ZNS STRAINED-LAYER SUPERLATTICES"<br>JOURNAL OF CRYSTAL GROWTH, NORTH-HOLLAND PUBLISHING CO. AMSTERDAM, NL,<br>vol. 101, no. 1 / 4,<br>1 April 1990 (1990-04-01), pages 550-553,<br>XP000174046<br>ISSN: 0022-0248<br>page 550, column 2 -page 551, column 1;<br>figure 1 | 1,26,29,<br>68,69  |
| A          | ---<br>DE JONG M J M ET AL: "Theory of luminescence quenching and photobleaching in conjugated polymers"<br>PHILIPS JOURNAL OF RESEARCH, ELSEVIER, AMSTERDAM, NL,<br>vol. 51, no. 4, 1998, pages 495-510,<br>XP004142739<br>ISSN: 0165-5817<br>page 499 -page 503   |  |
| A          | ---<br>US 5 424 560 A (HARVEY III THOMAS B ET AL) 13 June 1995 (1995-06-13)<br>the whole document<br>---<br>-/--  | 17,18  |

# INTERNATIONAL SEARCH REPORT

Inter. \_\_\_\_\_ Application No

PCT/GB 02/03935

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                     | Relevant to claim No.  |
|------------|--|--|
| P,X        | <p>DE 100 42 974 A (SAMSUNG SDI CO)<br/>28 March 2002 (2002-03-28)</p> <p>the whole document -----</p> | <p>1-9, 12,<br/>13, 16,<br/>19, 22,<br/>26-29,<br/>32-36,<br/>39-43,<br/>45-50,<br/>54, 62,<br/>63,<br/>68-70,<br/>73-77</p> |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 02/03935

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-9, 12, 13, 16-22, 26-29, 32-36, 39-43, 45-50, 54, 62, 63, 65, 68-77

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-9,12,13, 16-22, 26-29,32-36,39-43,45-50,54,62,63, 65,68-77

method of displaying information or use of display device or display device comprising

optoelectronic display comprising photoluminescent material between a pair of electrodes, illumination for the photoluminescent material to cause the photoluminescent material to photoluminesce, and biasing voltage applied to the electrodes to at least partially quench said photoluminescence.

2. Claims: 10,11,14,15,23,24,37,38,55-61

specific features of optical structure for illumination and method

3. Claims: 25,30,31,44,51-53,64,66,67,78

specific features of display device driver and method

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 02/03935

| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---|---------------------|----------------------------|---------------------|
| US 3649867                                | A | 14-03-1972          | NONE                       |                     |
| US 5424560                                | A | 13-06-1995          | EP 0687019 A1              | 13-12-1995          |
|   |   |                     | JP 8064862 A               | 08-03-1996          |
|   |   |                     | US 5681756 A               | 28-10-1997          |
| DE 10042974                               | A | 28-03-2002          | DE 10042974 A1             | 28-03-2002          |
|   |   |                     | JP 2002091380 A            | 27-03-2002          |
|   |   |                     | NL 1018484 A1              | 05-03-2002          |
|   |   |                     | US 2002027537 A1           | 07-03-2002          |